DI-BOX

MEASURE SET OF LIQUID INTENSITY FLOW
MANUAL

Flowmeter

FLOWBOX

- FLOW MEASURING CONVERTER **M1600**
- ULTRASONIC SENSOR **SPA 380**

Flume

PALMER-BOWLUS ZPB500

Wrocław 2015

Thank you for choosing product of our firm.
The DI-BOX company guarantees the big quality
of the purchased device and its proper operation.

The guarantee period for the purchased apparatus covers: **18 months**

Niniejsze urządzenie spełnia wszelkie wymogi w zakresie zgodności z normami dla urządzeń cyfrowych klasy B.

This manual was issued only in order for information purposes. All information included can be changed. The ***DI-BOX*** does not bear the responsibility for any direct and indirect defects arisen as a result of using this manual.

BHP HEALTH AND SAFETY. The assembly, starting, service, maintenance and repairs can be made exclusively by the qualified personnel in accordance with the obligatory safety principles.

The device is safe and works properly, if it is properly transported, stored, installed, started up, serviced and maintained. The product should be used in accordance with the manual.

BHP HEALTH AND SAFETY. **CAUTION: The improper service may cause getting hurt or serious device damage.**

Zakład Aparatury Kontrolno-Pomiarowej i Automatyki Przemysłowej

ul. Szczecińska 11a 54-517 Wrocław
tel. 071 353 86 55, 602 48 44 77 fax. 071 353 86 54
info@di-box.com.pl www.di-box.com.pl/

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl

TABLE OF CONTENTS

1. INITIAL INFORMATION 3
2. TECHNICAL DATA 3
2.1. Flow measuring converter M1600..... 3
2.2. Ultrasound level sensor 4
2.3. Palmer Bowlus ZPB flume 5
3. INSTALLATION OF MEASURING SET 6
3.1. Assembly recommendations 6
3.2. Connecting the wires to the converter 8
3.3. Scheme of electric connections of converter M1600 9
4. DEVICE SERVICE 10
4.1. Display of device 11
4.2. Correction of ultrasound sensor placement 11
4.3. Measuring scope and input electric current set 13
5. MAINTENANCE RECOMMENDATIONS 14
5.1. Palmer Bowlus ZPB flume and ultrasonic sensor..... 14

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl

1. INITIAL INFORMATION

The measuring set serves as not foamed liquid intensity measure flow in the gravitation conditions and total amount of sewage flowing through the measuring channel.

Measuring set consists of:

- → flow measuring converter M1600
- → ultrasonic level sensor SPA 380
- → Palmer-Bowlus ZPB500 flume

The basic condition to apply the method is to provide free, undisturbed inflow and outflow of liquid from the measuring flume.

2. TECHNICAL DATA

2.1. Flow measuring converter M1600

→ **Measuring scopes with reference to:**

Intensity flow measurement	for ZPB500
- in the entities m^3/h:	750
- in the entities m^3 (summary):	0...1.000 000

→ **Other data:**

Power supply:	~230V, 50Hz
Power consumption:	≤ 10 VA
Mass:	~1,5 kg

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl

Material:	ABS
Protection class:	IP65
Work temperature scope (without protective case):	-10 do 55 ^{o}C

2.2. Ultrasonic level sensor

SPA 380 is the ultrasonic inlet of distance for standard current signal intended for measuring the liquid level changes.

The basic usage is situated at measuring level in industrial and municipal sewage treatment plants, batch and reserve tanks, wells, sewage wet wells, measuring instruments in open channels, etc.

The device is made in the form of measuring probe having the microprocessor measuring instrument and ultrasound sensor.

The casing of the probe is made of PVC what assures the wide scope of usages in different environment conditions.

The membrane of ultrasound sensor is situated inside the casing and communicates with frontal surface of the probe by the acoustic coupler what protects it against the influence of environment conditions (humidity, caustic fumes, etc.)

The probe has the function of automatic cleaning of frontal surface of radiator with gathering sediments by the instant increase of the ultrasound wave emitted power.

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl

SPECIFICATION

Technical parameters

- → Accuracy: 0.10% of the scope in the laboratory conditions
  0.25% of the scope in the field conditions
- → Resolution: 0,7mm
- → Measuring scope: 0,10...1,8m.
- → Signal beam curve: 5-7° with decrease of the power of 3d
- → Temperature compensation: automatic

Output

- → Analogue output: : 4...20mA or 20...4mA
- → Max. load: R=(Uzas.-6)24mA

Programming: Local, manufactured programmed to ZPB500

Feeding: 18 to 30VDC max. 0.07A

Protection class: IP68

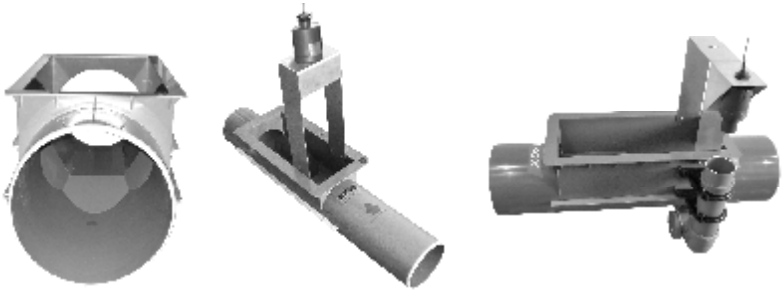
Thread diameter: 1.5" NPT

2.3. Palmer-Bowlus ZPB flume

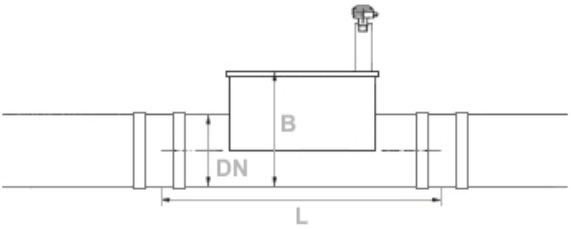
Palmer-Bowlus measuring flume is one of the prefabricated measuring flumes intended for measuring the flow in gravitation wires. It is recommended to gravitation channels with circular section and pipelines working without pressure.

The channel assures exact relation between the level of its filling and liquid flow intensity in the channel or pipeline.

The basic condition to apply the method is to provide free, undisturbed inflow and outflow of liquid from the measuring flume.



Typ koryta	*DN*	*Q nom m³/h*	*B*	*L*	*Typ koryta*	*DN*	*Q nom m³/h*	*B*	*L*
ZPB100	Ø 110	12	155	800	ZPB400	Ø 400	450	450	1500
ZPB160	Ø 160	45	210	800	ZPB500	Ø 500	730	550	1700
ZPB200	Ø 200	70	250	1190	ZPB600	Ø 630	980	685	2000
ZPB250	Ø 250	100	305	1190	ZPB800	Ø 800	1700	860	2600
ZPB300	Ø 315	220	368	1400	ZPB1000	Ø 1000	4380	1050	3500



! In order to obtain the proper flow intensity, the channel must be installed horizontally without fall.

! The basic condition to apply the method is to provide free, undisturbed inflow and outflow of liquid from the measuring flume.

3. INSTALLATION OF MEASURING SET

3.1. Assembly recommendations

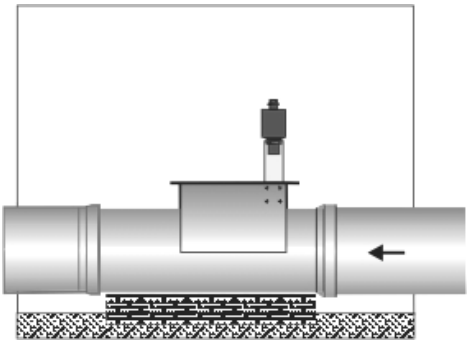
KORYTO POMIAROWE (zwężka ZPB):

- → Install the flume on the pipeline by means of inserting channel in pipeline goblet or typical hydraulic muff in the way of assuring the durability and tightness of the connection, remembering about the proper flume orientation (the indicator in the channel shows the flow direction).
- → Install the flume in the horizontal position without drops.
- → Perform support of the flume assuring its immobilization
- → Handle must screwed to the channel in the given places by means of eight M5 screws

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl

INLET AND OUTLET channels:

→ Provide free, undisturbed inflow and outflow of liquid from the measuring flume by means of ensuring long enough straight inlet and outlet channel parts.



ULTRASONIC LEVEL SENSOR:

→ SPA 300 sensor should be installed in the durable and safe way in the given measuring handle. The handle screwed to the reducer by means of 2x4 M5 should guaranteed solid and safe placement of the sensor during work.

→ Put the measuring sensor in the handle in accordance with the drawing. Use the washers. Screw the nuts 2,0".

→ The way of ultrasonic signal should be free of any disturbances.

→ The surface of the assembly should be free of vibrations.

→ The surrounding temperature should be between -20°C....+70°C

→ There should not be the electric power cables or electric power converters nearby

! In case of sensor installation outside you should cover it against the sunbeams and environment conditions.

! **The delivered sensor 380 SPA is calibrated for the determined type of flume and does not require any settings by the user. The change of factory settings will cause error of measuring converter.**

MEASURING CONVERTER:

- → It is recommended to use the roofing of the converter protecting it against direct influence of the atmospheric factors (for instance: rain, snow) or installation in safety case.
- → BHP HEALTH AND SAFETY. In order to assure the safety of service (for instance: during the starting up, maintenance and cleaning) the converter should be mounted in the easy available place.
- → All connections of electric wires should be placed as to prevent from their mechanical damage.
- → ! The installation of the device must meets with electromagnetic compatibility rules.
- → The influence of the disturbances of the other devices on the flow meter work **must be strictly eliminated!**

Rys. Dimensions of converter and span of holes for mounting bolts

Notes referring to set functioning

In order to assure the proper functioning of the measuring set, please to work in accordance with the manual.

3.2. Connecting the wires to the converter M1600

In order to connect the signal, output and power supply wires to the converter strip terminal in accordance electric scheme (chapter 3.5), you should:

- → Unscrew two screws visible on the frontal board,
- → Insert signal, power supply and output wires into the proper throttles,

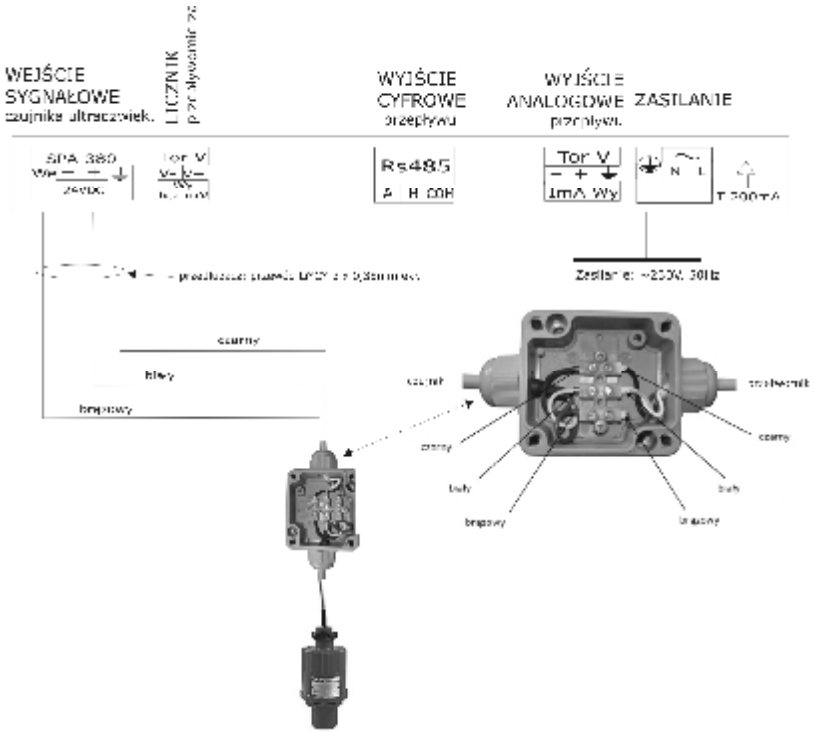
→ Connect the wires to the terminal strip and immobilize them screwing the throttles to the end.

BHP **HEALTH AND SAFETY: All electric connections should be made during switched off power supply of the measuring converter.**

Do not touch the strip joints while making the connection of the wires to the terminal strips (use the screwdrivers with the isolations, hang the wires on isolation).

Unscrew and take off a cover

3.3. Scheme of electric connections of converter M1600



→ ! Installation of the device must meets the electromagnetic compatibility rules.

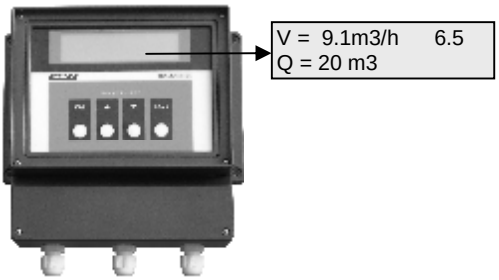
→ **The influence of the disturbances of the other devices on the flowmeter work must be strictly eliminated!**

4. DEVICE SERVICE

! The measuring set was configured to measurement the intensity and amount of sewages by using the measuring channel Plamer-Bowlus ZPB500 and level sensor SPA-380. The characteristics of measuring channel and proper measuring formula was implemented to the converter memory. The user should only set the parameter h0 in accordance with the point. 4.2.

In the event of change the sensor or measuring channel the converter **should be programmed in the company DI-BOX**.

The four-buttons keyboard and liquid-crystal unit are to communicate with the user.



4.1. Display of device

After connecting the measuring set in accordance with the electric scheme, to the factor of the converter there will be projected the following issues: indications of liquid flow intensity in m^3/h, summary amount flowing through the liquid channel and actual value of the liquid level in the channel.

Flow intensity

Summary liquid amount

```
V = 9.1m3/h      6.5
Q =  20 m3
```

Value of the liquid level in the flume [cm]

By pressing the button ∧ or ∨ you may switch a main display for an information of unit time duration and power stoppage.

Time duration

```
czas pracy       L_p
    1:25          11
```

Number of power stoppage

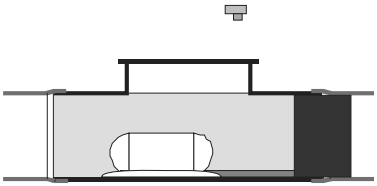
4.2. Correction of ultrasonic sensor placement

After proper installation of measuring set you should make the measurement of the setting of ultrasound sensor with relation to piling up element (measuring feet of flume).

It is the most effective way to do his

→ plug the input part of measuring channel

→ fill the input part with water as to overflow the water through the measuring feet and water level levels to the measuring feet.



→ check the value of the filling indicated by the converter on the display of the converter at factory settings

```
V = 0.0m3/h      -0.1
Q = 2 m3
```

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl

If the filling value h on the display is another than "0" (on the drawing h=-0.1) in these conditions (the lack of flow) you should:

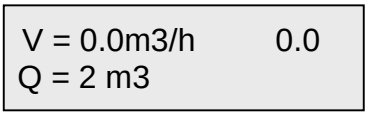
→ press the button **CAL** through about 20-30 seconds until the announcement displays:

It means that the ultrasound sensor front - in accordance with factory settings - is 78.7cm from the surface of channel measuring feet ZPB500.

→ buttons ∨ (or ^ depends on situation) decrease (or increase) the value H0 with size h displayed by the converter (in the described example the value h was -0.1cm so you need to increase this value h0, so the proper value h0 is 78.7 + 0.1=78.8cm)

→ press button SAVE

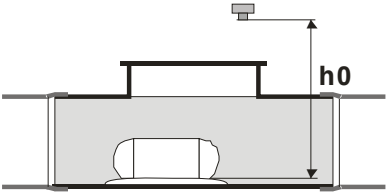
After making these activities there should be displayed the actual value, filling (level) of the liquid.



If there is not possible to perform the above-mentioned procedure for some reasons, applying the solution with lower exactness - physically measure the distance front sensor from measuring feet. In order to change the setting the following should be performed:

→ press the button **CAL** through about 20-30 seconds until the announcement displays

→ buttons ∨ or ^ set the new, with reference to factory settings, proper distance - for the channel ZPB, in accordance with the below mentioned drawing:



→ after measuring and setting the proper distance **h0** you should press button **SAVE**, what will be confirmed by **OK.**

4.3. Measuring scope and input electric current set

Wanting to read out or set the measuring scope or outflow current, one should:

→ press the button **SAVE** through about 5 seconds until the announcement displays:

0.0 - 800.0 4mA zakres pomiarowy

It means that the flow intensity measuring scope within the scope 0-800m3/h for the current scope 4-20mA was manufactured set. If there is a necessity to change it, you should press button **CAL** and then chose one of the scope by buttons ∨ or ^.

0-200m^3/h	**0**-20mA
0-400m^3/h	**0**-20mA
0-600m^3/h	**0**-20mA
0-800m^3/h	**0**-20mA
0-200m^3/h	**4**-20mA
0-400m^3/h	**4**-20mA
0-600m^3/h	**4**-20mA
0-800m^3/h	**4**-20mA

You should press SAVE what will be confirmed by OK.

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl

5. MAINTENANCE RECOMMENDATIONS

5.1. Palmer Bowlus ZPB flume and ultrasonic sensor

Check the permeability and clearness of the liquid piling up elements (measuring flume) depending on needs. The maintenance of the sensor refers to the occasional check of sensor surface clearness and possible wiping the sensor frontal surface with the soft cloth.

Copyright © DI-BOX 2015, www.di-box.com.pl, info@di-box.com.pl